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EXAMINER	
WERNER, BRIAN P	

ART UNIT	PAPER NUMBER
2621	6

DATE MAILED: 07/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/515,348	SPENCE, CHRISTOPHER A.	
	Examiner	Art Unit	
	Brian P. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 14 February 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2,4,5 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

1. Applicant is reminded of his duty to disclose material information. This includes relevant material cited throughout the specification but not provided in the IDS's submitted thus far.

Drawings

2. The corrected or substitute drawings were received on February 14, 2001. These drawings are acceptable to the examiner.

Specification

3. The possible use of the trademarks has been noted in this application (e.g., page 4, line 18, page 15, lines 15, and elsewhere). Trademarks should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner that might adversely affect their validity as trademarks.

4. The disclosure is objected to because of the following informalities: Page 15, line 21, "whic" should be - - which - -. Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim is unclear as recited, and not supported by the specification. That is, it is unclear which of the two previously recited structures (i.e., the first or the second simulated structures) the limitation "a structure" corresponds to. Further, there is no antecedent basis for "the transformed image". Further, there is no antecedent basis for displaying an image. Finally, there is no support in the specification for a comparison of one of the simulated structures with design data directly, and no support for "a percentage area ... within corresponding structure" at claimed. Rather, specification page 18, beginning at line 18 and ending at line 32, describes a comparison of a "percentage difference in overall area" (i.e., line 29) between both of the simulated structures (i.e., 352 prime and 352 double-prime; both of which correspond to simulated structures, and neither of which correspond directly to design data). There, there exists a fundamental difference between the claim and the specification. Clarification is required. The examiner will interpret the claim as follows: Wherein the FOM is a percentage difference in overall area the first and second simulated structures.

Note: The uncertainties in this claim rises to the level of a 35 U.S.C. 112 rejection because of the inconsistency between the claimed subject matter and the specification (See MPEP 2173.03).

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-3, 7-9, 13-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Pierrat et al. (US 6,091,845 A).

Regarding independent claim 1, Pierrat discloses a method of analyzing a wafer manufacturing process ("semiconductor devices ... detecting defects introduced during the photolithography process" at column 1, lines 5-7; "wafers" at column 1, line 18) comprising:

imaging a portion of a mask used in the wafer structure formation process (figure 1, numeral 130 and figure 3, numeral 230); and

simulating lithographic processing (figure 1, numeral 180 and figure 3, numerals 240, 250 and 260) using data received from or derived from the imaging of the portion of the mask (as seen in figures 1 and 3, the simulation directly uses the image of the

mask), thereby obtaining a simulated wafer structure (e.g., "simulated image" at column 5, line 22 comprises simulated structure, such as "elevation data" at column 5, line 56 and "sidewalls" at column 6, line 5).

Regarding claim 2, the method further comprises comparing (figure 3, numeral 270) the simulated structure (i.e., figure 3, numeral 260) to a second simulated structure (figure 3, numeral 265).

Regarding claim 3, the second simulated structure uses mask design data (figure 3, numeral 210).

Regarding claim 7, a same simulation method is used (figure 3, the same convolution and resist simulations are used; i.e., refer to numerals 250, 255, 260 and 265; Additionally, a separate embodiment is disclosed at figure 4, where the exact same simulations are performed in parallel, as depicted by numerals 230-262).

Regarding claim 8, the first and second simulations are aerial simulations (the Pierrat simulations are aerial simulations; e.g., an "aerial image measurement system" at column 5, line 8 is used to capture the mask image from which the aerial simulation is performed; the "simulation program logic is written in the C programming language" at column 6, line 16).

Regarding claim 9, a simulation step is applied to the imaged data (i.e., figure 3, numeral 240), where this step is not applied to the mask data (as depicted in figure 3). Thus, the overall simulation processes of the mask data and the imaged data are different.

Regarding claim 13, a SEM is used to capture the mask image ("SEM" at column 5, line 6).

Regarding claim 14, the SEM data is transformed into computer readable data (i.e., an electron image is transformed into the computer readable format required by the simulator; stated another way, a computer cannot manipulate an electron image direction, thus there must be some transformation of the electron image into a format required by the simulator).

Regarding claims 15 and 16, image analysis ("analyzes" at column 6, line 6) and scaling ("pixel erosion" at column 8, line 67; such an erosion algorithm reduces the size of a feature by eroding it away) of the data are performed.

Regarding claim 17, optical data is transformed into numerical computer data as depicted in figure 1 (i.e., light from 110 is passed through mask 161 and converted by sensor 130 to computer readable data).

Regarding dependent claim 18, an aerial image simulation program is disclosed (the Pierrat simulation is an aerial simulation; e.g., an "aerial image measurement system" at column 5, line 8 is used to capture the mask image from which the aerial simulation is performed; the "simulation program logic is written in the C programming language" at column 6, line 16).

Regarding dependent claim 20, the simulating includes simulating the developed resist image ("elevation data" at column 5, line 56 and "sidewalls" at column 6, line 5, both of which correspond to the "resist layer" at column 5, line 62, are simulated using "algorithms which emulate the behavior of resist material" at column 5, line 65).

Regarding claim 20, the simulating uses an aerial image microscope system (an "aerial image measurement system" at column 5, line 8 is used to capture the mask image from which the aerial simulation is performed; given that the structures of the mask being captured by Pierrat are extremely small, one of ordinary skill would understand that the "aerial image measurement system" is a microscope system).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Pierrat et al. (US 6,091,845 A) and Sheng (US 6,477,265 A).

Pierrat discloses generating first and second simulated structures as described above, whereby the structures are aligned and compared for defects (figure 1, numeral 140 and figure 3, numeral 270).

Regarding claims 10 and 11, Pierrat does not disclose displaying the first and second simulated structures on a display screen, at least partially overlapping one another.

Sheng discloses a photolithographic inspection system (Abstract, line 2), comprising the comparison of two image images to detect differences that are defects (figure 5; "defect detection" at column 3, line 56), wherein Sheng teaches displaying the

first and second images on a display screen, at least partially overlapping one another ("image display 44 displays the superimposed image" at column 3, line 41).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to superimpose and display the first and second simulated images of Pierrat, as taught by Sheng, so that in fulfilling Pierrat's requirement for defect inspection, the images of Pierrat "can easily be inspected for defects" (Sheng, column 2, line 21, line 25, and column 3, line 61).

11. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Pierrat et al. (US 6,091,845 A) and Sheng (US 6,477,265 A) as applied to claim 11 above, and further in combination with Fiekowsky (US 6,263,292 B1).

The Pierrat and Sheng combination as applied to claim 11 discloses comparing images of two simulated structures for differences due to defects.

The Pierrat and Sheng combination does not disclose providing a user with an option of selecting a figure of merit by which critical dimension variations between the simulated structures are to be calculated.

Fiekowsky discloses a mask inspection system (figure 1; "mask" at column 10, line 58), comprising providing a user with an option of selecting a figure of merit by which critical dimension variations between the images are to be calculated ("identifying and measuring a variety of features such as defects and line widths" at column 11, line 30; "user region of interest" at column 11, line 42; "the operator is able to enter review

mode and to quickly surround spot 71 with a rough user region of interest 72 indicating the region that the user wishes to analyze and measure" at column 11, lines 47-50).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the Pierrat and Sheng combination as applied to clam 11, by providing a user selected figure of merit (e.g., "line widths ... heights" at column 4, Fiekowsky lines 21-22; "diameters" at Fiekowsky column 3, line 64) as taught by Fiekowsky, in order to provide "a measurement tool that provides an objective, practical and fast method for accurate sizing of mask features found with an automatic inspection tool" (Fiekowsky, column 3, lines 61-64).

12. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Pierrat et al. (US 6,091,845 A) and Fiekowsky (US 6,263,292 B1).

Pierrat, as applied to claims 1-3 above, discloses comparing images of two simulated structures for differences due to defects.

Regarding claim 4, Pierrat does not disclose providing a user with an option of selecting a figure of merit by which critical dimension variations between the simulated structures are to be calculated.

Regarding claim 5, line width is not disclosed.

Regarding claim 6, percentage of a difference in area is not disclosed.

Regarding claims 4 and 5, Fiekowsky discloses a mask inspection system (figure 1; "mask" at column 10, line 58), comprising providing a user with an option of selecting a figure of merit by which critical dimension variations between the images are to be

calculated ("identifying and measuring a variety of features such as defects and line widths" at column 11, line 30; "user region of interest" at column 11, line 42; "the operator is able to enter review mode and to quickly surround spot 71 with a rough user region of interest 72 indicating the region that the user wishes to analyze and measure" at column 11, lines 47-50).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Pierrat, by providing a user selected figure of merit (e.g., "line widths ... heights" at column 4, Fiekowsky lines 21-22; "diameters" at Fiekowsky column 3, line 64) as taught by Fiekowsky, in order to provide "a measurement tool that provides an objective, practical and fast method for accurate sizing of mask features found with an automatic inspection tool" (Fiekowsky, column 3, lines 61-64).

Regarding claim 6, percentage of a difference area is one of many measures of differences between features that is well known, and would have been obvious to one of ordinary skill in the art in order to determine the extent of the difference.

Conclusion

13. Regardless of whether applicant amends the claims or argues the prior art, the examiner request's the following information to assist in making a determination of patentability: In any discussion of "differences" and "distinctions" between the prior art and the claims, the examiner requests that the explanation be focused on not just the fact that there are differences in the first place, but how those differences are "distinguishing differences", or "patentable differences". Certainly, claims can be drafted

and amended in many ways to recite differences. However, a patentable difference is something that provides a benefit or a criticality to applicant's invention to solve a problem of the prior art, or fulfill some long felt need, etc. That is, the patentable difference "is" the invention. Should applicant feel that a claimed feature (whether existing or added by amendment) is in fact a "distinguishing feature", or "the subject matter which the applicant regards as his invention or discovery" (i.e., in accordance with Rule 75(a) and equivalently 35 U.S.C. 112, second paragraph), the examiner requests further clarification in the response as to why, or how this is the case in order to better take a decision on patentability (i.e., an explanation of how the difference is not just a minor difference, a design choice, a coincidental difference, etc.). Provision of this information may assist the examiner in the goal of expediting prosecution.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian P. Werner whose telephone number is 703-306-3037. The examiner can normally be reached on M-F, 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on 703-305-4706. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4750.

Brian Werner
Primary Examiner
July 24, 2003

BRIAN WERNER
PRIMARY EXAMINER